SIMTRACKER

Organizing and Managing Results from Computer Simulations

Overview

Efficient exploration of results from supercomputer calculations requires filtering and summarizing the data. The SimTracker tool summarizes calculational results by automatically generating metadata, e.g., text and image snapshots, throughout a calculation. This metadata is presented to the user via dynamically generated web pages. These thumbnail sketches with hypertext links to applications and data can be used to monitor the calculation as it runs, to review results, and to document the calculation for future reference.

Large-scale computer simulations—a hallmark of computing at the national laboratories—often take days or weeks to run and can produce massive amounts of output. A typical environment for many scientists includes multiple hardware platforms, a large collection of eclectic software applications, data stored on many devices in many formats, and little standard documentation about the data. The exploration of simulation results has become a laborious process requiring knowledge of this complex environment and of many application programs.

Web-Based Solution

The ASCI Scientific Data Management project at Lawrence Livermore National Laboratory (LLNL) has developed tools to help scientists access and organize their scientific data and information. One such tool is SimTracker, which offers a web-based approach for exploring simulation results both during and after a calculation. The SimTracker tool automatically generates metadata summaries that serve as a quick overview and index to the archived results of simulations (Fig. 1). These summaries provide convenient access to the data sets and associated analysis tools. They include graphical thumbnail images, pointers to all relevant files associated with the simulation, and an assortment of fields ranging from location and time of the calculation to comments and scalar physics values.

Extensibility

SimTracker is an extensible application that is easily adapted for use with different simulation codes. SimTracker now works with nearly a dozen physics and engineering simulation codes at LLNL, Sandia, and Los Alamos National Laboratory (LANL). This web-based approach to monitoring and documenting simulations can be applied to other areas as well. Environments in which users run many simulations or generate large numbers of data files could benefit from SimTracker's high-level framework for conveniently viewing and organizing simulation results.

Because SimTracker was designed to be "non-intrusive," its components are separate from the code system (Fig. 2). End users and code developers are not required to make extensive changes to their current mode of operation to use SimTracker.

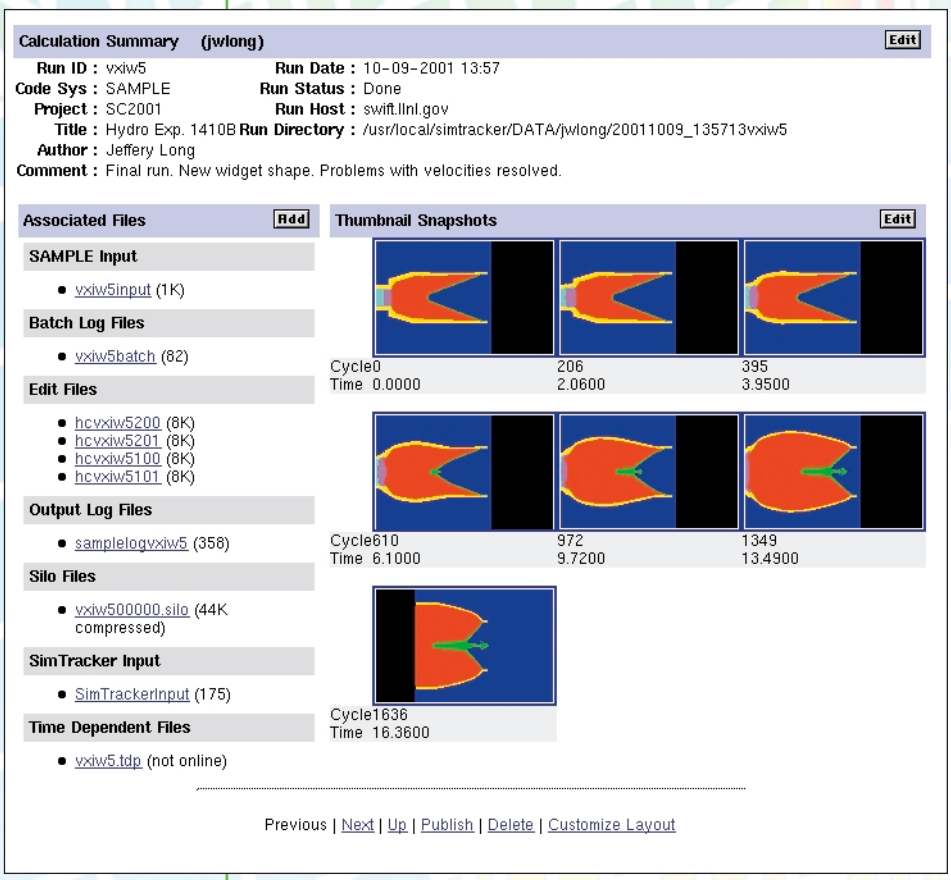

Figure 1. An example of a SimTracker calculation summary.

Generating Summaries

SimTracker consists of two components: one for generating calculation summaries and a second for viewing them. The generation component creates calculation summaries from simulation output. It runs on the large computing platforms along with the simulation codes. The generation component runs data translation and conversion utilities, compresses data files, creates metadata that

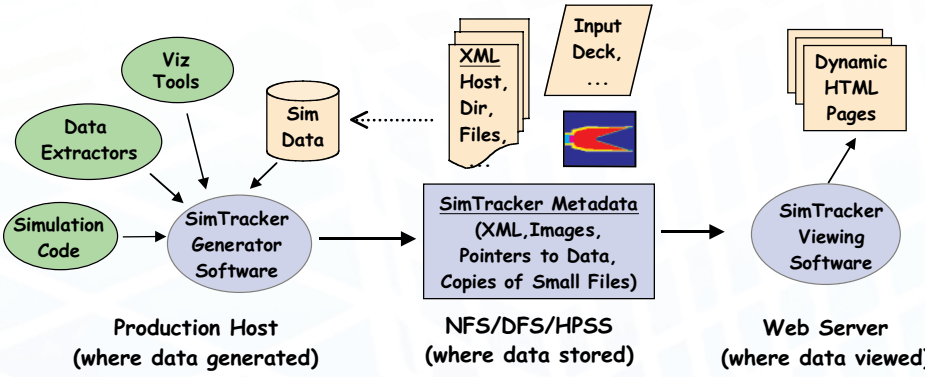

Figure 2. SimTracker architecture diagram, illustrating separate components and use of code system utilities.

describes the calculation and where it is stored, runs post-processors to create visualizations, and copies requested result data and metadata to archival storage.

Viewing Summaries

SimTracker's viewing component is responsible for creating the web-based interface to the results. Dynamic hypertext documents are created by a series of web programs that extract metadata from calculation summaries generated earlier. A variety of views are provided, ranging from a high-level table of contents showing all of a user's simulations to an in-depth results page from which numeric values can be extracted and analysis tools can easily be launched (Fig. 3).

The Table of Contents page allows the user to scan through all of their simulation runs, or to filter out just runs from a particular code system or project. The Results page allows the user to review extensive information collected about a particular run, including when, where, why, and how it was run. It is also from the Results page that the user can delete, share, or view data files. The Cycle page, which allows the user to review information about a particular state in a simulation, is a convenient place to launch analysis tools when further explore the scientific data is necessary.

Future Plans

SimTracker developers are working with end-user scientists to collect user feedback and to help guide new development. The team will continue to work with a variety of groups at LLNL, Sandia, and LANL to deploy the software with new simulation codes.

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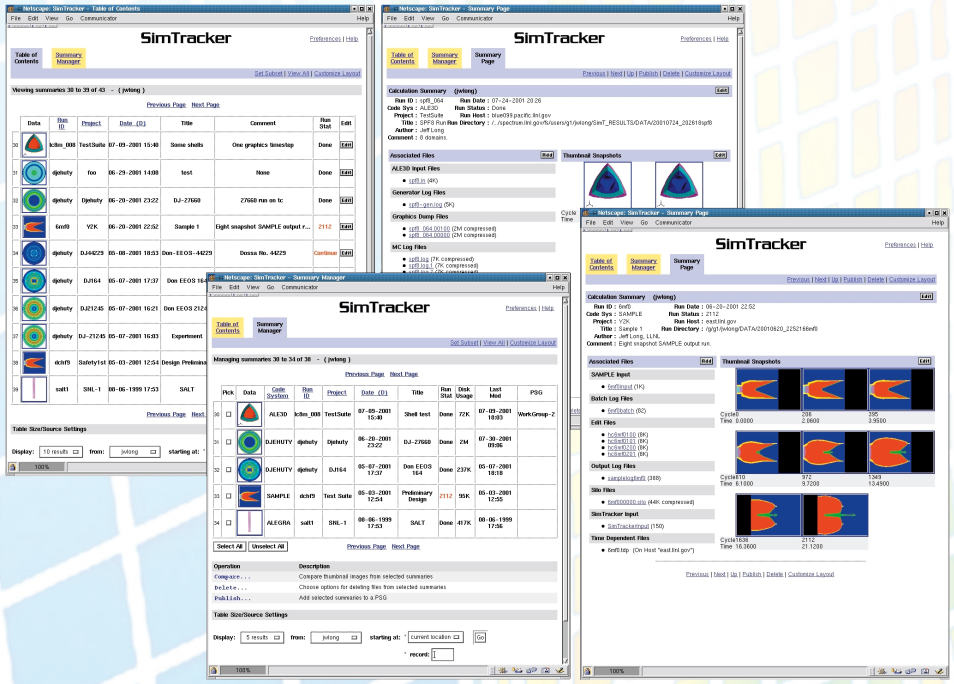

Figure 3. A sampling of views, illustrating the various levels of detail available in the SimTracker viewer.

Related Projects

ASCI VIEWS
http://www.llnl.gov/asci/views_trilab/

ASCI SDM
http://www.ca.sandia.gov/asci-sdm/

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